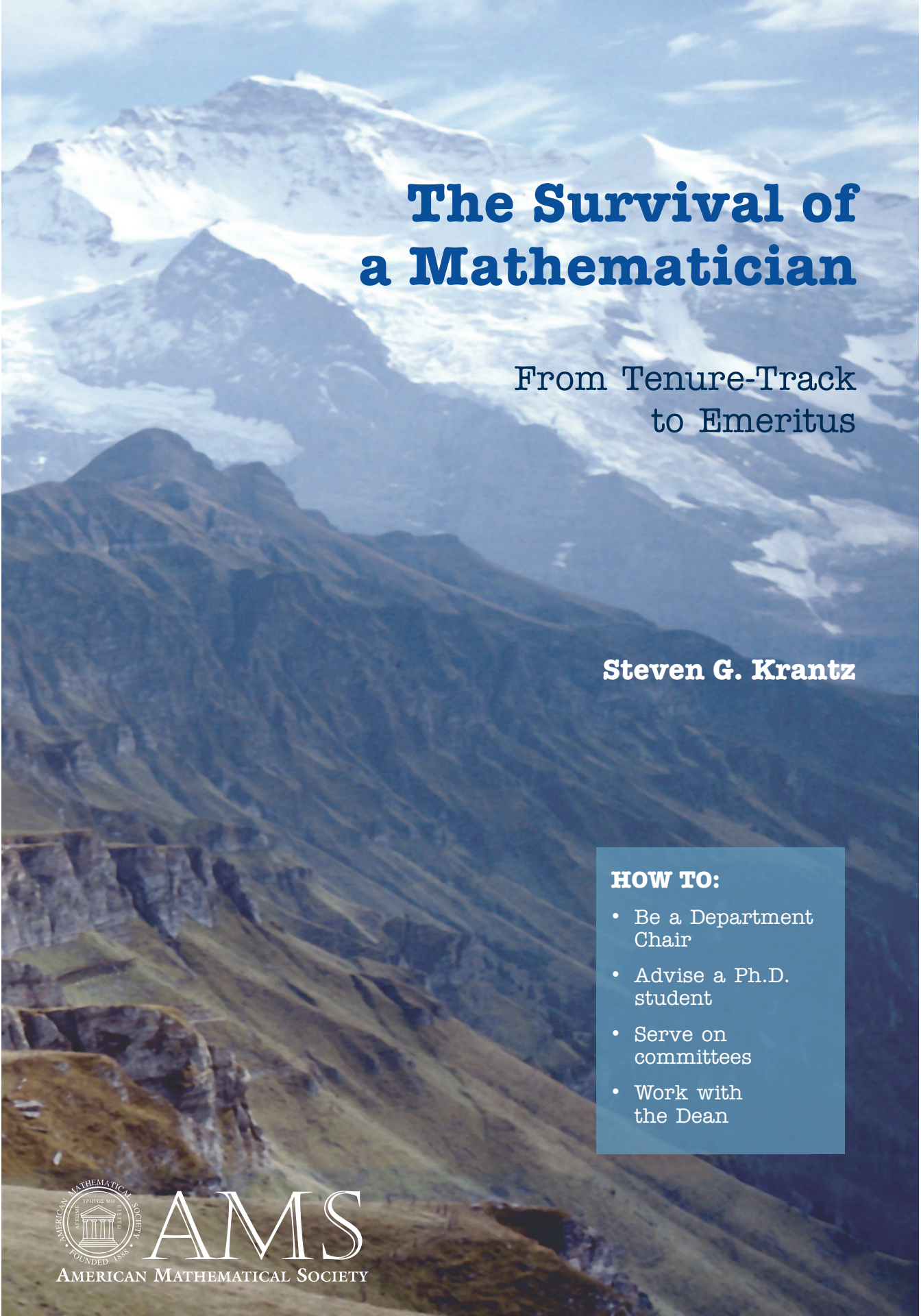

The Survival of a Mathematician

From Tenure-Track to Emeritus

Steven G. Krantz

HOW TO:

- Be a Department Chair
- Advise a Ph.D. student
- Serve on committees
- Work with the Dean

AMS
American Mathematical Society

The Survival of a Mathematician

From Tenure-Track
to Emeritus

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To all the advice I never got and had to figure out for myself.

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Preface

A few years ago I wrote and published a book with the American Mathematical Society called *A Mathematician's Survival Guide* [KRA3]. This volume was intended to help the student learn how to become a mathematician. Feedback from readers has indicated that this book has found an appreciative audience, and it has been successful in mentoring young mathematicians. The book helps the newly minted Ph.D. to find his/her place in the mathematical firmament and to learn how to get along in the profession. My motivation for writing that book was a commonly held belief or observation that mathematics is traditionally a sink-or-swim vocation; there is nobody to tell you what you are supposed to (or are expected to) do in your new position, how you are to learn the ropes, and how you are to advance and realize your potential. There is some truth to this claim, but two comforting facts are that this differs little from the challenge facing most people as they embark on their careers and that there is guidance to be found for those who seek it.

Certainly the transition from the intensity and often solitary activity of getting a thesis written to the sociopolitical structure of an academic or industrial job can be a shock to the system. Nothing in your formal education prepares you for the many nuances and loopholes of your new work environment. You will have many new choices as to what sort of working environment you should select; if you are fortunate, you will find one that suits your interests and proclivities. This could be a first-rate academic/research environment, or it could be a primarily teaching environment, or it could be in a genome lab, or with a computer firm, or with a branch of the federal government. In every instance you will face similar questions: What am I supposed to do (on a daily basis, and also in the long run)? How do I function

effectively and successfully in this new setting? What are my goals? What is expected of me? To whom am I answerable?

On the face of it, the Ph.D. is preparation for a research career. The fresh Ph.D. should be chomping at the bit to prove theorems and write papers. But it is a hard fact that most American Ph.D. mathematicians write very few papers. According to recent statistics from the American Mathematical Society, of those authors who publish anything at all in their careers:

- About 43% publish only one paper
- About 15% publish only two papers
- About 8% publish only three papers
- About 75% publish five or fewer papers

Many authors publish just a paper based on the thesis and nothing more. Why is this? Is the cutting of the (academic) umbilical cord so traumatic that most people just fall off the wagon? Or are the reasons more complicated? Do people just get wrapped up in other duties, or other career pursuits, and decide after a while that "publish or perish" is not part of their credo? Are they perhaps in jobs in which publishing and doing research is not really the thing that is rewarded?

And what about teaching? If you are working for the National Security Agency (as, for instance, three of my Ph.D. students now are), then you certainly will not be teaching classes, grading papers, or giving grades. But you *will* have to give seminars. You *will* have to mentor others. You *will* have to provide guidance to younger staff members. How does one learn these skills?

And, no matter where you work or what you do, you will no doubt work as part of a team. You will have to function in meetings and on conference calls and in interactions with your supervisors and your subordinates.

If you are in an academic job, then your role(s) in life is carefully delineated and described in your institution's *Tenure Document*: teaching, research, and service are the three branches of an academic's professional activity. He/she is judged on each of these, and in different ways. For example, if you manage to prove the Riemann hypothesis, then it doesn't matter whether you spend your time at staff meetings rolling your eyes and humming *The Battle Hymn of the Republic*. If you are a world-class teacher,

then you will probably be granted some slack in your research program. If you are a terrific departmental citizen, seen as a person who holds the ship of state together, then you will perhaps not have to put in quite so much time on the other two portions of your profile.

The bottom line is that there is an awful lot about this profession that you are going to have to figure out for yourself. This book is intended to help you through the process. One of the main messages here is to *talk to people*. Find a senior faculty member who is willing to let his/her hair down and tell you some things about how life works in your department, or your organization, or your company. Bond with others who are your peers and who can share experiences with you. Become friendly with the staff, with the Chair, with the key players in your group or department. I can assure you that—if you are in an academic department—a good deal of the decision of whether to tenure you is based on raw quality, but another good part of it is based on collegiality and whether you will fit in. Is this someone that we want to have knocking about in this building for the next forty years or not? Is this someone whom we would look forward to seeing each day? These are intangibles, not written in any guidebook or *Tenure Document*. But they are facts of life.

The purpose of the present volume is to give you some hints as to how to make your way in the academic world, or more generally in the corporate world or professional world of mathematics. I cannot claim to be expert in every nuance and corner of the profession; but I have had more experience than most. I can certainly help you to avoid most of the pitfalls.

I should perhaps stress that I know quite a lot about the life of a mathematician in the United States. I know very little about that life in other countries. I do know that there can be considerable differences—in culture, in style, and in emphases. I must leave it to another scholar to write a book about the mathematical life in Italy or Sri Lanka.

By the same token, almost all of my professional experience has been of an academic nature. I have done some consulting, and I have collaborated with nonmathematicians. So my communication skills are moderately well developed. But I have never worked for Microsoft, or at the Social Security Administration, or in a genome laboratory. And I probably never will. I know some of the key features of non-academic jobs, and I intend to share them here. But it is a foregone conclusion that the focus of this book will be largely on an academic career.

It is a pleasure to thank Gerald B. Folland and James S. Walker for a

careful reading of an early draft of this book, and for contributing many useful and incisive comments. Robert Burckel, in his unbeatable style, studied every word that I wrote and corrected them accurately and mercifully. David Collins painstakingly taught me the chapter and verse of the *Chicago Manual of Style* (or CMS), and many other truths about language and accuracy as well. Ed Dunne, as always, was an encouraging and dynamic editor. He read several drafts of the book and contributed decisively to its form and structure. Ed also engaged five excellent reviewers who contributed incisive criticisms and suggestions that have certainly made the book tighter and more on point.

Mathematics is a highly varied, rich, and rewarding life. Welcome to it. I hope that you spend a very pleasant and productive thirty or forty years making your way through the profession, and that you find many rewards and comforts. May this book be your touchstone as you get started.

— Steven G. Krantz
St. Louis, Missouri

Glossary

> As with any sophisticated professional activity, being a mathematician carries with it a certain amount of verbal baggage. There are all sorts of terms that we commonly bandy about that would mystify the average layman. And, if you are new to this business, they may mystify you as well. So I include most of them here for your delectation. Definitions are the author's own, and the reader may find variants in the literature.

AAAS See *American Association for the Advancement of Science.*

AAUP See *American Association of University Professors.*

A.B.D. Abbreviation for "all but dissertation" (also called "A.B.T.," or "all but thesis"). The phrase describes a student who has completed all parts of the Ph.D. program *except* for the dissertation. At many schools, "A.B.D." is an official status, and you fill out some paperwork to ratify the fact that you have done everything but the dissertation. A great many students leave graduate school at the A.B.D. stage and never complete the degree.

Abel Prize Created in 2002 by the Norwegian government, this prize is modeled after the Swedish Nobel Prize and is intended to recognize excellent work in mathematics.

A.B.T. See *A.B.D.*

academic integrity The rules of conduct by which we live academic life. These include not to cheat on exams and not to plagiarize. Also one should respect the work of others.

Academic Senate A governing body of the university, usually peopled by elected members of the faculty. Also called the *Faculty Senate.*

ACM See *Association for Computing Machinery.*

actuary A mathematical scientist who calculates annuities, amortization plans, and other insurance data.

adjunct faculty Teaching faculty, usually those who are hired to teach specific, individual courses. Such people are paid by the course, and usually have no benefits.

Administrative Assistant See *Head Secretary*.

Allendoerfer Award Beginning in 1976, this award was created for papers in *Mathematics Magazine*. The prize is administered by the Mathematical Association of America.

American Association for the Advancement of Science (AAAS) This is an international, nonprofit organization dedicated to advancing science around the world by serving as an educator, leader, spokesperson, and professional association. In addition to organizing membership activities, AAAS publishes the journal *Science*, as well as many scientific newsletters, books, and reports.

American Association of University Professors (AAUP) This is a labor organization for university professors—a little bit like a union. It looks after the rights and privileges of those in the professorial ranks. It seeks to protect tenure and academic freedom.

American Mathematical Monthly A primary mathematics journal of the Mathematical Association of America. See the URL `http://www.maa.org/pubs/monthly.html`.

American Mathematical Society (AMS) A professional organization of mathematicians that is primarily interested in research and its attendant activities. Publishes many important books and journals and organizes significant meetings.

American Statistical Association (ASA) One of several professional mathematical associations in the United States. The purpose of the ASA is to support and promote statistical activities and scholarship. Consult the URL `http://www.amstat.org`.

AMS Cover Sheet A standard information sheet, available on the Internet and also in issues of the *Notices of the American Mathematical Society*, to be included with job application materials.

AMS Employment Center The job interview activities sponsored by the AMS/MAA/SIAM at the January annual meeting.

ASA See *American Statistical Association*.

ASL See *Association for Symbolic Logic.*

Assistant Professor This is the junior level in the academic ranks. After six years, an Assistant Professor will be considered for tenure and promotion to Associate Professor.

Associate Professor This is the middle level in the academic ranks, between Assistant Professor and Full Professor. An Associate Professor is tenured, and can participate in most departmental decisions (including tenure decisions for junior faculty). An Associate Professor will have more responsibilities than an Assistant Professor.

Association for Computing Machinery (ACM) A national organization that is "a major force in advancing the skills of information technology professionals and students". The Association engages in publishing and organizes conferences. See the URL `http://www.acm.org`.

Association for Symbolic Logic (ASL) A national mathematical organization that concerns itself with fostering and promoting logic and issues that are of concern to logicians. The Association publishes journals and books and organizes conferences. See the URL `http://www.aslonline.org`.

Association for Women in Mathematics (AWM) A professional organization of mathematicians that promotes the interests of women.

Bachelor of Arts Degree Also called the B.A. This is usually a four-year degree, and is the capstone of the undergraduate experience. The degree requires about 120 credit hours of course work and sometimes a thesis. A B.A. degree is usually in the humanities, the arts, or sometimes the social sciences. See *B.A. degree.*

Bachelor of Science Degree Also called the B.S. This is usually a four-year degree, and is the capstone of the undergraduate experience. The degree requires about 120 credit hours of course work and sometimes a thesis. A B.S. degree is usually in the sciences or engineering. See *Bachelor of Science degree.*

B.A. degree The Bachelor of Arts degree. This is usually a four-year degree, and is the capstone of the undergraduate experience. The degree requires about 120 credit hours of course work and sometimes a thesis. A B.A. degree is usually in the humanities, the arts, or sometimes the social sciences. See *Bachelor of Arts degree.*

Bachelor's degree A degree marking the completion of the first four years of *undergraduate* study.

Stefan Bergman Prize A prize of the American Mathematical Society for excellent research in complex analysis.

George David Birkhoff Prize A prize to honor excellent work in applied mathematics.

Board of Trustees This is a collection of businesspeople and prominent social leaders who govern the university or college at a very high level. The Board of Trustees approves all tenure appointments, approves the budget, and engages in other governing activities.

Bôcher Prize An award given by the American Mathematical Society in recognition of excellent work in analysis.

bottom line The total or aggregate line from a budget. The phrase is often used to denote the concluding thought from any discussion.

breadth requirement Courses not in the major field that a student must complete in order to ensure his/her familiarity with a variety of modes of discourse. A key part of a *liberal arts* education.

Chair Either the *Chairperson* or the *Head*.

Chairperson A department Chairperson is a leader among equals. The Chairperson is supposed to implement policies that are made by the departmental faculty as a whole. Like a Head, the Chairperson is answerable to the Dean, but he/she also serves the overall faculty. Often a Chairperson is "selected" by a departmental vote or mandate. Nonetheless, the Dean chooses and appoints the Chairperson.

Chair Professor A distinguished rank among senior faculty is the endowed Chair Professor. This is a special position, usually created with private funds from donors. It entails special perks and privileges, and certainly a high salary.

Chancellor The Chancellor is the Chief Executive Officer of a college or university. One could also be the Chancellor of an entire university system. Whereas the Provost manages the internal operations of the institution, the Chancellor is in charge of the interface with the public and the government. Especially at a state or public institution, the Chancellor must work with the legislature to ensure that the university has adequate funding and other public support. See *President*.

Chauvenet Prize A prize, sponsored by the Mathematical Association of America, to recognize excellent mathematical exposition.

College A four-year institution of higher learning that grants Bachelor's degrees and perhaps Master's degrees. Usually a college does not grant the Ph.D. Harvard University has inside it an institution called "Harvard College" which grants undergraduate degrees.

Frank N. Cole Prize An award given by the American Mathematical Society in recognition of excellent work in algebra.

college major At most colleges and universities, an undergraduate will have a field of concentration. Thus the student will take a certain number of courses of general study—just to ensure some background in the humanities, the arts, the social sciences, and the laboratory sciences—before picking a particular subject area in which to concentrate. The student will typically take twenty class hours or more in the major subject area.

college minor In addition to a *college major*, an undergraduate student today will often have a second field of concentration called a "minor". This will be a subject, perhaps related to the major area, in which the student will take several courses and perhaps even write an undergraduate thesis.

colloquium A formal lecture, usually given by a member of another department and often by a professor from another university, that is given for the benefit of the entire math department. The lecture is usually preceded by a ceremonial tea, and there is often a celebratory dinner and even a party afterward.

comprehensive university These institutions started out as the "normal schools", that is, schools that were dedicated to teacher training. Seventy-five years ago there were hundreds of these throughout the country. Today most of these institutions have changed their names, and in some cases, their missions. The primary mission of a comprehensive university today is teaching at the undergraduate and Master's levels.

computer system manager These days most every math department needs somebody to manage the computer system. This includes *e*-mail, the Internet, software installation and maintenance, and hardware installation and maintenance. Ideally, this is a full-time person who is at the service of the department.

Conant Prize A prize, awarded by the American Mathematical Society, to recognize an excellent expository paper in the *Bulletin of the AMS* or the *Notices of the AMS*.

Concerns of Young Mathematicians (CYM) An Internet periodical

devoted to issues that are of interest to those beginning in the mathematics profession. See the URL `http://www.youngmath.net/concerns`.

Conference Board of Mathematical Sciences (CBMS) A national board, a subsidiary of the National Academy of Sciences, that oversees the welfare of the mathematical enterprise in this country. Of particular note are the CBMS conferences. See the Websites
`http://www7.nationalacademies.org/bms/`
and `http://www.cbmsweb.org`.

course work In the context of a Ph.D. program, this is an explicit requirement that the student take a certain number of credit hours of courses. Often the number is thirty-six hours, but it can be more. Some of these credit hours may be filled with *independent study* courses.

Crafoord Prize A prize analogous to the Nobel Prize, also awarded by the Swedish academy. It recognizes fields complementary to those honored by the Nobel, including astronomy, mathematics, geosciences, and biosciences.

Curriculum Vitae (CV) The analogue of what business people call a résumé. This document provides your personal and professional information. It is part of any job application that you may submit.

CV See *Curriculum Vitae*.

CYM See *Concerns of Young Mathematicians*.

DARPA See *Defense Advanced Research Projects Agency*.

Dean The Dean is a university administrator who sits above all the department Chairs. For example, the Dean of Arts & Sciences at a university runs the Arts & Sciences program. He/she will often manage twenty-five departments. Such a Dean may have an annual budget of $150 million or more.

Defense Advanced Research Projects Agency (DARPA) A branch of the Central Intelligence Agency that is dedicated to defense-related research. The Agency supports many research projects in mathematics.

Department Administrator See *Office Manager*.

departmental service Service by faculty on departmental committees; service by faculty in teaching evaluation; service by faculty in curriculum development; service by faculty in hiring and promotion. And there are many other activities of this nature. Departmental service (and university service) figure into all tenure and promotion decisions.

Department of Energy (DOE) An agency of the U.S. Federal Government that is concerned with energy issues and research in parts of science that impact on energy. In recent years, DOE has been a significant source of funding for mathematical research. See the URL `http://www.eia.doe.gov`.

dissertation Also called the *thesis*. The magnum opus of a Ph.D. program, this document (often seventy-five pages or more) is the student's disquisition on a subject of original research.

Doctorate A *Ph.D.* or other degree at that level. Medicine and Law and the Arts also have Doctoral degrees.

DOE See *Department of Energy*.

Doob Prize A prize, sponsored by the American Mathematical Society, to recognize an excellent mathematics book with wide appeal.

elite private university These are generally privately-funded institutions with large endowments. They receive little or no direct funding from the state or federal government, and are therefore quite independent in their policies and educational procedures.

EIMS See *Employment Information in the Mathematical Sciences*.

Employment Information in the Mathematical Sciences (EIMS) A hard-copy publication of the mathematical societies in which current job openings are advertised. See the URL
`http://www.ams.org/eims/eims-search.html`.

Endowed Chair Professor A Professor for whom the salary, travel funds, and other perks of the position come from a special, endowed fund. It is a great honor to be an Endowed Chair Professor.

Euler Prize Named after Leonhard Euler, this prize was endowed by Paul and Virginia Halmos to recognize an outstanding book about mathematics. The prize was first awarded in 2007.

faculty, disciplining of It happens occasionally that a faculty member will have to be disciplined. This could entail various penalties that must be paid. Usually the Chair, in consultation with the Dean, will handle minor infringements. Major infractions will involve the Provost.

faculty meeting A gathering of the faculty for the purpose of making departmental decisions.

Faculty Senate One of many governing bodies at a college or university. The membership will consist of elected faculty. Also called the *Academic Senate*.

fellowship A grant to pay some or all expenses and support for either a graduate student or a faculty member.

Fields Medal The highest honor in the mathematics profession, awarded every four years to between two and four mathematicians under the age of forty.

final oral See *thesis defense*.

FOCUS The newsletter of the Mathematical Association of America.

Lester R. Ford Award These awards were established in 1964 to recognize authors of articles of expository excellence published in *The American Mathematical Monthly* or *Mathematics Magazine*. The award is administered by the Mathematical Association of America.

freeway flier A person who makes his/her living by having part-time jobs at several different colleges or universities.

Full Professor This is the senior level in the academic ranks. It is the Full Professors who run a department. They decide who gets tenured and who gets promoted to Full Professor. They have a strong voice in hiring and other key decisions.

fungible Funds in a budget are fungible if they can easily be moved from one category to another. For example, funds for foreign travel can often be moved to domestic travel.

generals See *qualifying exams*.

genome project The project, which received massive federal funding, to map the human genome. This project is now substantially completed.

graduate school An educational program that follows upon the usual four-year American undergraduate educational experience. Among other degrees, the graduate program will offer the Master's degree, the Ph.D., or both.

grant This is a quantity of money, provided by a Federal agency or perhaps a private foundation or even by the university, to subsidize a research activity or a curricular project or an educational enterprise. One usually applies for a grant through a formalized procedure, and there is intense competition for grants.

Haimo Award A national award for excellent teaching.

Head A department Head is appointed by the Dean to run a department. Unlike a *Chairperson*, the Head is rather math autonomous. He/she can take advice from the faculty, but will make decisions based on his/her own

judgment. Put in other terms, the Head is answerable only to the Dean. See *Chairperson*.

Head Secretary Also called an Administrative Assistant, an Administrative Aid, or an Administrative Head. This is the chief of all the staff in your department. This person oversees all the secretaries and other staff. Also it is typical for this person to be a budgetary officer and to handle other high-level administrative duties. This person is a direct assistant to the Chair.

Hughes Aircraft Founded by aviator and entrepreneur Howard Hughes, this is one of the big aircraft manufacturers in Los Angeles. Hughes employs a good many math Ph.D.s from UCLA.

Humboldt Fellowship A fellowship sponsored by the Humboldt Foundation that promotes cooperation and collaboration between German scholars and non-German scholars.

ICM See *International Congress of Mathematicians*.

independent study An arrangement made between a faculty member and a student (either undergraduate or graduate) whereby the student will study a subject area on his/her own and perhaps meet with the faculty member once per week to discuss progress and to ask questions. Usually a student will receive course credit for an independent study.

IMS See *Institute of Mathematical Statistics*.

IMU See *International Mathematical Union*.

Institute of Mathematical Statistics A professional organization located in Beachwood, Ohio. The purpose of the institute is to foster the development and dissemination of the theory and applications of statistics and probability.

instructorship This is a temporary, usually two- or three-year job for a beginning Ph.D. An instructor spends time at a major research institution in order to be exposed to some important ongoing research programs and some important senior mathematicians. The instructorship will also have some teaching duties. After the instructorship, he/she will apply for an Assistant Professorship (usually at another institution). Also called a *postdoc*.

International Congress of Mathematicians (ICM) An international gathering of mathematicians, held every four years. This meeting is organized by the International Mathematical Union. It is where the Fields Medals are awarded. It is an important event at which the status and progress of the

field are assessed. The ICM was held in Madrid in 2006 and will be held in Hyderabad in 2010.

International Mathematical Union (IMU) This is the international aggregation of mathematical scholars—in effect the union of all the national mathematical societies. The IMU considers broad issues that affect mathematicians worldwide. It organizes and holds the International Congress of Mathematicians every four years. It awards the Fields Medals. See the URL `http://elib.zib.de/IMU/`.

invited talk at the ICM An invited 45-minute talk at the International Congress of Mathematicians. A definite distinction for mathematicians. See also *plenary talk at the ICM*.

IT Sector The Information Technology Sector. This is the computer industry and other allied industries that center around Silicon Valley activities.

journal A periodical publication in which mathematical research is published. There are also journals that are devoted to teaching and to exposition.

junior college A college with a two-year curriculum leading to an Associate of Arts (or A.A.) degree. Junior colleges do *not* grant Bachelor's degrees. Junior colleges often act as feeder schools to the large state universities.

large state universities Ever since the late nineteenth century, states in the U.S. have had a well-developed system of publicly supported universities. In many states these are very large institutions. For families of modest means, the state university is the default place to send their children for higher education.

leave See *unpaid leave*.

liberal arts college A four-year institution of higher learning that concentrates on giving students a well-rounded education in the humanities and the arts as well as a particular field of concentration.

Librarian for the department Ideally the math department should have its own librarian. There are more than 1,700 math journals and many thousands of math books and other resources that need to be at the fingertips of the mathematicians in the department. Especially with all the different types of electronic media, and all the different choices that there are today, it is essential to have a professional in charge of information management.

line item This is a yearly provision in your departmental budget for a particular standing need. For example, there could be a line item in your departmental budget for $10,000 per year for computer equipment.

M.A. See *Master of Arts degree.*

MAA See *Mathematical Association of America.*

MacArthur Prize A prize to recognize excellence in all fields of human endeavor. This prize is typically five years salary; it is an immensely prestigious and lucrative encomium.

major professor The Professor who directs a Ph.D. thesis. See *thesis advisor.*

Master of Arts Degree A first-level graduate degree, usually in the humanities, the arts, or the social sciences. Earning of this degree may entail passing a course requirement, the taking of some qualifying exams, and possibly writing an expository thesis.

Master of Science Degree A first-level graduate degree, usually in science or engineering. Earning of this degree may entail passing a course requirement, the taking of some qualifying exams, and possibly writing an expository thesis.

Master's Degree A postgraduate degree, usually requiring two to three years of study. This will be in a particular field, like mathematics or chemistry. A Master's degree is intermediate between a Bachelor's degree and a Doctorate. Earning of this degree may entail passing a course requirement, the taking of some qualifying exams, and possibly writing an expository thesis.

maternity leave A leave of absence from work—often with partial or full pay—so that a female parent may assist in the care of a newborn child.

Mathematical Association of America (MAA) A professional organization of mathematicians that is primarily interested in teaching and exposition. Publishes a number of important books and journals and also organizes meetings.

Mathematical Reviews The hard-copy archiving tool of the American Mathematical Society, extant since 1940. This periodical records all papers published in all the major journals, together with complete bibliographic information and a concise review. See the URL
`http://www.ams.org/mr-database`.

`MathSciNet` This is the OnLine version of *Mathematical Reviews.* It is currently a twenty Gigabyte database Internet resource for locating mathematical papers and reviews thereof.

matriculation The meaning of this word has changed over time, and is also different from country to country. Traditionally matriculation was a ceremony in which the freshman at the university was given a set of exams to gauge qualification for study. When the student passed, he/she was then matriculated. Today it is more common to use the word "matriculation" to mean registration at the university.

media The physical devices on which we record our ideas for a paper or book or our presentation for a lecture. Traditionally the primary media were different types of paper or cardboard. Today they could be an overhead slide or a disc or tape or cartridge or flash drive or other mass storage device.

mentor A senior individual who imparts advice, and the wisdom of experience, to a neophyte.

E. H. Moore Prize A prize to recognize an outstanding research article in one of the AMS primary research journals.

Morgan Prize A prize to recognize excellent undergraduate research.

M.S. See *Master of Science Degree*.

National Academy of Sciences (NAS) A distinguished organization of scientists in the U.S. whose mission is to advise the president in matters of science. More broadly, the NAS helps to set science policy for the country. There are 117 mathematicians in the NAS, and it is a great honor and distinction to be elected to this body.

National Research Council (NRC) A federal organization that oversees research programs for the government. See the URL `http://www.nas.edu`.

National Research Council (NRC) Group Rankings The National Research Council's ranking of mathematics Ph.D. programs entails, among other things, a grouping of mathematics Ph.D. programs into Group I, Group II, . . . , up to Group V. Departments are ranked according to several characteristics, the main one being the scholarly quality of the faculty. In the 1995 ranking, Group I comprises forty-eight departments with scores (in the report [GMF]) in the range 3.00–5.00. Group II comprises fifty-six departments with scores in the range 2.00–2.99. Group III comprises seventy-two departments with scores in the range 0–1.99. Group IV lists doctoral programs in statistics, biostatistics, and biometrics. Group V lists doctoral programs in applied mathematics and applied science.

National Science Foundation (NSF) An agency of the federal government that is dedicated to the support of basic research in science. Probably

the greatest supporter of research in pure mathematics.

National Security Agency (NSA) A federal agency that works in mathematical areas pertaining to the security of the nation. A particular specialization is cryptography. In addition to being a likely place of employment for Ph.D. mathematicians, the NSA is also a source of research funding. See the URL `http://www.nsa.gov`.

Notices of the American Mathematical Society A primary journal of the American Mathematical Society. This is *not* a research journal. Rather, it is the official organ of the AMS. It contains a great deal of society news. See the URL `http://www.ams.org/notices`.

NRC See *National Research Council*.

NSA See *National Security Agency*.

NSF See *National Science Foundation*.

NSF Postdoctoral Fellowship A fellowship program of the National Science Foundation designed to permit participants to choose research environments that will have maximal impact on their future scientific development. The program provides twenty-four months of support for each awardee. See the URL `http://www.nsf.gov/funding/pgm_summ.jsp?pims_id=5301`.

Office Manager The senior staff person in the department. Sometimes called the *department administrator*.

orals See *qualifying exams*.

Ostrowski Prize A mathematics award given every other year by an international jury from the universities of Basel, Jerusalem, Waterloo, and the academies of Denmark and the Netherlands. The prize, founded in 1989, is funded by the estate of Alexander Ostrowski.

outside offer A job offer from an institution other than your home institution—the one where you have a job right now. An outside offer can be generated because of your research qualifications, or your teaching qualifications, or your ability to have an impact on infrastructure. For a senior faculty member, an outside offer could be generated to attract him/her to be Chair.

paternity leave A leave of absence from work—often with partial or full pay—so that a male parent may assist in the care of a newborn child. Usually this requires the male parent proving that he is providing more than half the care.

Ph.D. The highest academic degree that is granted by most universities in the United States. It is based on *course work*, *qualifying exams*, and a *thesis* that contains original research.

Ph.D. advisor See *thesis advisor*.

Ph.D. Candidate A student who has passed the qualifying exams and has a thesis advisor and thesis problem.

Ph.D. thesis See *thesis*.

PI See *Principal Investigator*.

plenary talk at the ICM An invited one-hour talk at the International Congress of Mathematicians. Considered to be a great honor.

political correctness The idea that one should use language carefully, so as not to abuse or oppress others who cannot defend themselves. An idea that has taken strong hold in universities.

postdoc Also called a "postdoctoral position". See *instructorship*.

President The Chief Executive Officer of a University or College. See *Chancellor*.

Principal Investigator The primary scientist on a proposal to the National Science Foundation or other granting agency. The person responsible for the work proposed in the grant. Also called the PI.

professional society An organization whose purpose is to sustain and promote the profession (i.e., mathematicians). The American Mathematical Society, the Mathematical Association of America, the Society for Industrial and Applied Mathematics, and the Association for Women in Mathematics are four (but certainly not all) important professional societies in the mathematics profession.

Professor See *Assistant Professor*, *Associate Professor*, and *Full Professor*.

Professor Emeritus This is a retired Professor who is granted certain privileges—such as use of the staff and the library and the computer system. It is something of an honor to be deemed an Emeritus Professor, as opposed to just a retired Professor.

Project NExT A consortium of young mathematicians across the country which gathers regularly to share concerns and to help bring beginners in the profession up to speed. Project NExT particularly stresses networking among its participants. See the URL `http://archives.math.utk.edu/projnext/`.

Provost The Provost at a university sits above all the Deans. Typically the Provost is referred to as the "chief academic officer" of the university. The Provost runs the day-to-day operations of the institution.

publishing a paper The process by which one writes up a paper with original results, submits it to a journal, undergoes the refereeing process, and then has the work appear in a journal.

"Publish or perish" A byword of American higher education for the past half-century, this phrase encapsulates the sentiment that one must engage in academic research and publishing in order to obtain tenure and to flourish as a professor.

Putnam Exam Sponsored by the Putnam Stock Fund, the William Lowell Putnam exam is a nationally competitive math competition that has run continuously since 1938. The exam is six hours, and has twelve questions. The top prize is a fellowship to Harvard University.

qualifying exams A set of exams that students must take in the major subject areas of mathematics—often these are geometry, algebra, and analysis (although some schools may allow other subjects as well)—in order to qualify to write a Ph.D. thesis. Usually these are written exams, though at some schools they could be oral.

recuse If a member of a committee has a conflict of interest on a particular issue, then he/she will recuse himself/herself from the discussions—meaning that he/she will not take part. The person will also not vote on that decision.

research Scholarly activity that involves developing new ideas or discovering and establishing new truths. Research is a large part of scholarly life.

research university An educational institution that grants undergraduate degrees (the B.A. and/or the B.S.) and also graduate degrees (the M.A., M.S., and Ph.D.). Such an institution will also have a faculty that has a vigorous research program, publishes widely, and visits universities all over the world (to collaborate with their faculties and to lecture about their work).

reward system The value system by means of which faculty are rewarded. This would entail a consideration of teaching, research, and departmental service—weighted in an appropriate fashion.

David P. Robbins Prize A prize to recognize excellent work in algebra, combinatorics, or discrete mathematics.

sabbatical Many institutions of higher education, especially research universities, offer to their faculty the opportunity to take a paid leave of absence

every seven years. At some schools this privilege is guaranteed. At others one must compete for a sabbatical.

Satter Prize A prize to recognize outstanding research by a woman.

seminar This is a working group that usually meets once a week to learn some focused subject area of mathematics. Most of the time, the seminar speakers will be members of the home math department.

service Every tenure-track faculty member will have duties in the department, ranging from committee service, to acting as Vice-Chair, to supervising a task force. The aggregate of these activities is referred to as *service*.

sexual harassment A legal term referring to abuse of power to gain sexual favors. Punishable by prison term or other severe sanctions.

SIAM See *Society for Industrial and Applied Mathematics*.

Silicon Valley Centering around Los Gatos, California (where the Apple Computer was invented), this is today one of the hubs of the computer and technology industry.

Sloan Foundation Fellowship Fellowships given to enhance the careers of the very best young faculty in the sciences. The Sloan Fellowship enables a young mathematician to take a one-year (or longer) leave of absence at another research institution. See the URL `http://www.sloan.org`. In fact the Sloan Foundation supports a variety of academic activities, both for junior and for senior faculty.

Society for Advancement of Chicanos and Native Americans in Science (SACNAS) A professional society of mathematicians that promotes the interests of Chicanos and Native Americans.

Society for Industrial and Applied Mathematics (SIAM) A professional organization of mathematicians that promotes the interests of applied mathematicians and mathematicians who work in industry. The society publishes a number of important books and journals and organizes meetings.

soft money Money obtained from grant funds. These are not part of the regular university budget, and can disappear when the grant expires.

staff These are the non-academic members of the math department, including secretaries, computer managers, some counselors, and so forth.

startup fund A fund provided to a new hire (usually by the Dean, but sometimes by the math department itself) to help with setup, equipment purchases, bringing in collaborators, and the like.

state universities See *large state universities*.

Leroy P. Steele Prize Three awards given by the American Mathematical Society in recognition of **(a)** a seminal paper, **(b)** an outstanding career contribution, **(c)** writing (usually a book).

subvene If your university is paying your expenses for a trip then it is subvening your travel.

Systems Administrator The person in your department who manages the computer system, all software and hardware.

TA See *teaching assistant*.

teaching Teaching students—especially undergraduates—is the way that college and university faculty justify their existence to the public and to the administration. This is the one faculty activity that everyone understands.

teaching assistant (TA) A graduate student who assists in the teaching of university classes. This is usually done as part of the arrangement to justify the financial support of a graduate student.

teaching evaluation Traditionally these are paper surveys that are distributed to students in a class near the end of the semester to assess the effectiveness of the teaching. These are collected by a student and turned in to the math department office so that the Professor cannot see them until after the semester is completed. Today teaching evaluations are sometimes done OnLine.

teaching load The number of courses per semester, or per year, that you are required to teach. Mathematicians frequently describe their teaching load as "3-and-2"—meaning that they teach three courses in one semester and two courses in the other. Sometimes people will describe their teaching load in terms of the number of contact hours.

tenure This is a form of job security that is special to academic life. A tenured faculty member is *very* difficult to terminate. Typical grounds for termination of tenure are **(a)** moral turpitude, **(b)** fiscal indiscretions, **(c)** academic fraud. Tenure was originally created so that faculty could pursue daring or controversial courses of study, or teach "dangerous" ideas in class.

tenure clock Every Assistant Professor, by the rules of the American Association of University Professors, must be considered for tenure before seven years of his/her contract expire. Thus every Assistant Professor is on a *tenure clock*. When a person accepts a job as an Assistant Professor, there is some negotiation as to how the tenure clock will be initially set. Sometimes

the new Assistant Professor gets credit for time served elsewhere, sometimes not.

Tenure Document Every college or university has a document called the *Tenure Document* which lays out **(i)** what tenure is, **(ii)** how tenure is bestowed, and **(iii)** how tenure can be forfeited. It is not clear to anyone what the legal status of the *Tenure Document* is, but in the context of the university it defines how things work. All tenure decisions are based on this document. All cases of adjudication of tenure are based on this document. Although it is not widely disseminated, it is readily available to all faculty.

tenure dossier The collection of materials, including teaching evaluations, outside review letters, information about service, a publication list, and other information that pertains to a tenure case.

tenure, loss of It is quite difficult to lose tenure, but fiscal malfeasance, sexual misconduct, or failure to teach are some of the reasons that this can come about. There are strict and detailed procedures, outlined in the *Tenure Document*, for adjudicating these matters. Every level of the university is involved in such a decision.

tenure-track Describes those positions in the department that may lead to tenure.

textbook The book that is used as a resource in a course. Some courses will have more than one textbook. Some courses will use an OnLine textbook. A textbook will often have supplements, such as a Solutions Manual.

thesis Also called the *dissertation*. The magnum opus of a Ph.D. program, this document (often seventy-five pages or more) is the student's disquisition on original research.

thesis advisor The professor who directs the Ph.D. thesis. Often the advisor provides the problem that the student works on, and offers advice and encouragement along the way. The thesis advisor will be a tenure-track faculty member.

thesis committee The committee, chaired by the thesis advisor and made up of members of the math department plus select members of other departments, that adjudicates the validity of the Ph.D. thesis. The thesis committee presides over the *thesis defense*.

thesis defense The final ceremonial presentation by the Ph.D. candidate of the thesis results to the Ph.D. committee and a select audience.

thesis problem The question or subject area that you will study in order to develop the materials for your Ph.D. thesis.

TIAA-CREF TIAA stands for "Teachers Insurance and Annuity Association" and CREF stands for "College Retirement Equities Fund". These two programs were created by Andrew Carnegie to ensure that America's teachers were well cared for in their golden years. A good many college and university instructors and professors have retirement packages that depend on TIAA-CREF.

two-body problem The problem of a mathematician and his/her partner who are both professionals, and who both seek employment at a new location.

undergraduate This is a student in the first four years of college, studying for a Bachelor's degree (a B.A. or B.S. is typical).

underrepresented group A societal group—women or African-Americans or Native Americans or one of several others—that has a lower percentage representation in the mathematics profession than the percentage of its representation in the American population. The definition of "underrepresented group" is somewhat political, as Asian-Americans do *not* usually constitute an underrepresented group.

university Traditionally this is an institution of higher learning that has the power to grant Ph.D. degrees.

university service Service by faculty on university-wide committees. This may entail teaching evaluation, curriculum development, evaluating tenure cases, administering discipline, or many other duties. University service (and departmental service as well) figures into all tenure and promotion decisions.

unpaid leave This is a leave of absence from your home university or institution in which you are paid entirely by the host institution (and your home institution provides no funds).

Veblen Prize A prize to recognize excellent work in geometry.

Vice-Chair for Graduate Studies This is an administrative post in the department for managing the graduate program. It is usually occupied by a tenured Professor.

Vice-Chair for Undergraduate Studies This is an administrative post in the department for managing the undergraduate program. It is usually occupied by a tenured Professor.

vita See *Curriculum Vitae*.

Norbert Wiener Prize A prize to recognize excellent work in applied mathematics.

Wolf Prize A prize to recognize mathematical research in a variety of fields.

Zentralblatt für Mathematik The European version of `MathSciNet`, published by Springer-Verlag. Today known as **Zentralblatt MATH**. Their digital-age, OnLine version is available for free on the Web at `http://www.emis.de/ZMATH`. See also `http://www.zblmath.fiz-karlsruhe.de/`.

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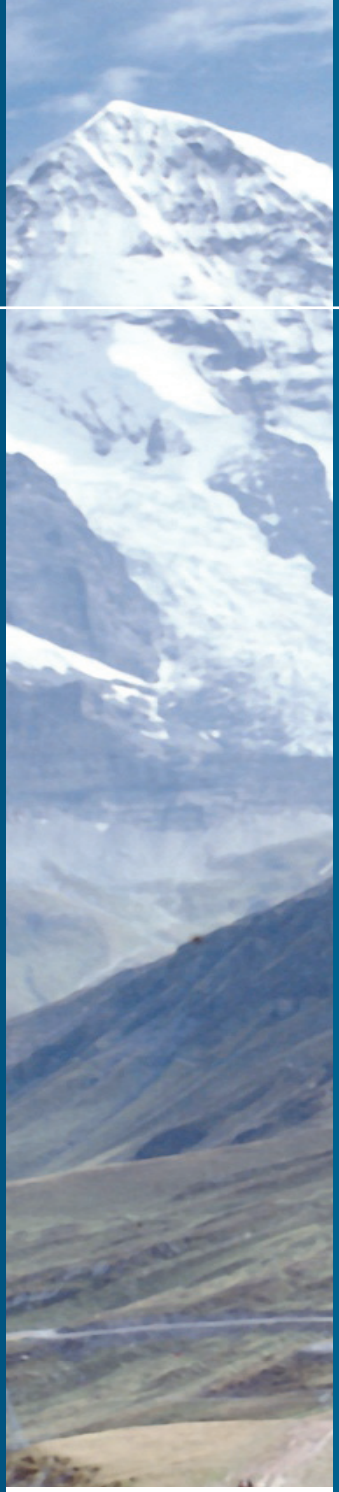

A successful mathematical career involves doing good mathematics, to be sure, but also requires a wide range of skills that are not normally taught in graduate school. The purpose of this book is to provide guidance to the professional mathematician in how to develop and survive in the profession. There is information on how to begin a research program, how to apply for a grant, how to get tenure, how to teach, and how to get along with one's colleagues. After tenure, there is information on how to direct a Ph.D. student, how to serve on committees, and how to serve in various posts in the math department. There is extensive information on how to serve as Chairman. There is also material on trouble areas: sexual harassment, legal matters, disputes with colleagues, dealing with the dean, and so forth.

One of the themes of the book is how to have a fulfilling professional life. In order to achieve this goal, Krantz discusses keeping a vigorous scholarly program going and finding new challenges, as well as dealing with the everyday tasks of research, teaching, and administration.

In short, this is a survival manual for the professional mathematician—both in academics and in industry and government agencies. It is a sequel to the author's *A Mathematician's Survival Guide*.

Steven G. Krantz is an accomplished mathematician and an award-winning author. He has published more than 150 research articles and over 50 books. He has worked as an editor of several book series, research journals, and for the *Notices of the AMS*.

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